

**SYSON-HILLE  
and  
ASSOCIATES**

Engineering Services  
Since 1982

Tracy & Carboy  
5473 Blair Road, #200  
Dallas, TX 75231

December 5, 2004

**Attn:** Mr. E. Todd Tracy

**Re:** Warrick v. Breed: Report

Dear Mr. Tracy,

At your request, I have inspected and analyzed the vehicle from which Heather Warrick was ejected and fatally injured. I have placed special emphasis on the safety performance of the rear lap/shoulder belt restraints of the subject 2001 Jeep Wrangler. Prior to stating my opinions, here is an outline of my education, training and experience in safety belt restraint system evaluation:

**I. Background, Qualifications and Methodology**

- A. My curriculum vita, publications, presentations and testimony list are attached as Attachments 1-4.
- B. My opinions are based on my background, experience and expertise in the field of automotive design analysis engineering, and on the application of recognized laws of physics and principles of mechanical and automotive engineering to the specific issues raised by the events in question.
- C. My expertise includes the field of automotive design analysis engineering -- the specialty of analyzing the design and performance of vehicles, including restraint systems. While employed by GM, I was assigned to the GM Safety Research and Development Laboratory (SRDL) at the GM Proving Grounds, from September 1971 through August 1978, as an engineer in the restraints, structures and analytical groABF Freight Systems. Additionally, I was responsible for analyzing crash tests, sled tests and field performance of GM vehicles and restraint systems. It has been part of my background



and training to:

1. Utilize general mechanical engineering background and training, including numerous principles of the laws of physics and their application to the operation of mechanical objects.
2. Utilize special knowledge of automotive engineering, including knowledge of principles of physics and mechanical engineering as applied to the design, manufacture and performance of automobiles and component parts, including restraint systems.
3. Utilize special background and training in principles of design and analysis of design of automotive restraint system and the performance of automotive restraint systems :
  - a. In the testing environment.
  - b. In studying the relationship between testing and "real world/field" performance based on testing and analysis of testing.
  - c. In actual "real world" collisions.

D. Portions of my opinions are based on a review of testing and analysis conducted by the National Highway Traffic Safety Administration (NHTSA) and by IMMI, as well as on my background and knowledge in the conduct and analysis of such testing. Testing, including crash, sled and component testing of restraint systems, is performed for the purpose of analyzing the behavior of vehicle component parts under controlled laboratory conditions, and using that analysis to predict and understand how the components will behave under foreseeable "real world" conditions, including rollover collisions.

1. During the development phase of vehicle design and manufacture, tests and test analyses are routinely used by engineers to
  - a. Investigate and predict the behavior of the vehicle and its components in the "real world,"
  - b. Set criteria for designs
  - c. Validate designs.
2. Failure during controlled testing should be documented, investigation of the causes of the failure should be documented, and response to the failure should be documented. During my employment at GM, Test Incident Reports, sometimes called Test Information Reports (TIR's), were required to be completed, in the event of a failure, and follow-up documentation was required.
3. During recent years, I have become aware that GM continues to have a policy of completing TIR's for crash and sled test failures.
4. If a component fails during developmental testing, the responsible design engineer should take corrective action to control or eliminate the causes of the failure.
5. Failure during controlled testing, if not corrected, is predictive of failure under field conditions.

## II. Design Experience

- A. I designed the following prototype hardware while I was working for General Motors:



1. The upward deploying air cushion passive restraint system "air pillow" used on many of today's automobiles, notably Honda (US Patent: 3,801,126)
  2. The steering column mounting system for the GM do Brasil Opala
  3. The prototype steering column mounting system for the GM X body. (US Patent: 4,241,937)
- B. I participated in the analysis, testing and development of the designs of the structures for the following GM vehicles:
1. 1976-1997 G (full size) van
  2. 1977-1990 B-C (full size) car
  3. 1978-1986 A-G (intermediate) car
  4. 1980-1984 X (compact) car.
- C. I was responsible for the analysis of the structural performance and overall crash safety assessment for the "Competitive Car Program". As part of that program I reviewed the crash test data and high speed motion pictures of both front and rear crash tests of vehicles from auto manufacturers in the US, Japan and Europe.
- D. I was GM's representative on the SAE (Society of Automotive Engineers) impact simulation subcommittee.
- E. I was the Safety Research and Development Laboratory representative to the 1979 E body (sport luxury) Project Center.
- F. I did all the structural analysis and testing for the Large Research Safety Vehicle (LRSV) structure at Minicars.
- G. I supervised the development of the restraint systems for the Volvo 240 series vehicle under NHTSA contract. I presented the design improvements to Volvo at their engineering department in Gothenburg, Sweden. Volvo implemented the design improvements. There, subsequently, were NO driver fatalities in 240 series vehicles on US highways for several years.
- H. I designed the entire roof and floor structure for the Paratransit Vehicle, a taxi to carry handicapped individuals, under contract to the Urban Mass Transit Administration. (UMTA)
- I. I designed the side impact protection enhancements for the Modified Integrated Vehicle (MIV) program. Volvo has implemented the door-sill override guard that I invented as a part of its Side Impact Protection System (SIPS).
- J. Since becoming involved in the full time analysis of real world collisions, I have continued to study the design of restraint systems, particularly seat belt buckles. I have made a number of presentations regarding buckle design and testing at Annual Meetings of the American Academy of Forensic Sciences (AAFS). I have also, as part of the Seat Belt Buckle Safety Project:
1. Analyzed the design and construction of at least one hundred different production buckles from all over the world
  2. Reviewed almost seven hundred US buckle Patents and more than three hundred foreign patents for buckles (Attachments 5 and 6)



SYSON  
and  
ASSOCIATES

3. Reviewed lab tests for many of the production buckles, including end release buckles manufactured for DaimlerChrysler.
- K. I have had papers, on automotive restraint issues, published by the Society of Automotive Engineers (SAE), and by the American Society of Mechanical Engineers (ASME).
- L. My presentations have illustrated the methodology of analysis of occupant restraint and physical evidence of occupant contact that I have used in this matter (Syson, 1995).

### III. Assignment

- A. I was requested to determine whether a defect existed in the 2001 Jeep Wrangler's Breed rear seat safety belt restraints, or if an action or inaction on the part of Breed, the component supplier, caused or contributed to the injuries to Ms. Warrick in this collision.
- B. I have performed this assignment using methods used by other automotive engineers, who are engaged in the profession of accident analysis.
- C. I have used the same methods to analyze evidence of seat belt use that are described in publications of the SAE (Moffatt, 1984), the Accident Investigation Quarterly (Jacobson, 1996), the AAFS (Gorski, 1990) and General Motors (Gamero, 1991).

### IV. Analysis

- A. In performing my analysis, I began with an examination of the physical and testimonial evidence that was available regarding this particular collision. The evidence and testimony included:
  1. The police accident report
  2. The accident vehicle and its front occupant restraint system
  3. Other examples, where similar safety belt buckle defects caused ejection, including Moran and Zickefoose v. DCC.
- B. The facts, above, lead to several reasonable conclusions:
  1. Kathryn Creamer was driving the vehicle, since she was found in the driver's seat. Joseph Ayers was the right front passenger
  2. The Texas Peace Officer's Accident Report places Heather Warrick in the left rear seat. Other testimony and physical evidence suggests that she was in the right rear seat
  3. Wear on the right rear safety belt confirms regular use of that belt
  4. Witness marks confirmed that the right rear belt was used in this collision
  5. She was partially ejected through her quarter window opening, she was then, completely ejected out the driver's side and was found underneath the Wrangler at the end of the crash sequence.
- C. Scientific Method Evaluation of the "Defense Safety Belt Hypothesis"



1. It is customary under the above circumstances that the manufacturers of safety belts and vehicles equipped with safety belts take the position that the victim was unbelted.
  2. Their only evidence that they point to in support of this hypothesis is the fact that the victim was ejected from his or her vehicle.
  3. For this hypothesis to be true, the following corollaries would also have to be proven:
    - a. There must be no evidence of belt use.
    - b. There must be no possibility of restraint failure.
  4. Both corollaries are demonstrably false, since there is evidence that Ms. Warrick was belted, and this buckle design is known to unlatch, even in tests conducted by the NHTSA.
- D. The obvious lack of credible evidence supporting the "Defense Hypothesis" led me to examine the following alternate hypothesis: *Ms. Warrick was wearing her safety belt immediately prior to the initiation of the collision sequence, and that the tongue (latch plate) became disengaged from the buckle during the accident. Therefore, the safety belt failed to prevent her from being ejected from the vehicle.*

### The Scientific Method:

*"The scientific method is the best way yet discovered for winnowing the truth from lies and delusion."* Jose Wudka, September 1998.

The scientific method is a technique to assure that the various aspects of research and development are generally approached in a structured way. It consists of five or six definite steps that should be followed to be sure the study is conducted appropriately:

**Problem Identification:** The scientist should recognize that there is a problem that needs to be studied, and clearly state that problem. For example, assume a trained investigator determines there is likelihood that an individual was wearing his seatbelt at the start of a collision sequence. His findings are, also, that the belt was unlatched after the collision. He identifies the problem that the particular buckle may not remain latched in collisions.

**Information Gathering:** Using published and unpublished sources, the scientist should attempt to determine if the problem has been studied historically. Often this step is combined with step 1. In the example noted above, a review of the historical literature, Patents, etc. may reveal a pattern of buckle designs that are intended to address various types of buckle failures. Let's say, for example, separation due to shock loading, and a condition where the buckle seems latched, but in fact is not completely latched.

**Hypothesis:** Based on the results of steps 1 and 2, he should formulate a prediction of an expected solution to the problem. In the example problem, the buckle would then be examined to see if it has the features that are intended to prevent shock-related separations and insecure latching. Depending on the results of that examination, the scientist would, for example, hypothesize that the buckle separated due to shock loading.

**Experiment:** The investigator should objectively test the hypothesis, under controlled conditions. In the case of a seat belt buckle, an analysis of the design would lead to an experimental program that would evaluate one or more of the hypothetical failure modes. For example, sensitivity to shock loading could be



evaluated by impacting a buckle in several different directions to see if it will open. By measuring the parameters that result in separation, or in the buckle remaining fastened, the risk of separation can be evaluated.

**Observation:** The results of all tests should, in some way, be recorded. For example, a seat belt buckle's sensitivity to shock could be measured by accelerometers, force gages, velocity sensors, drop height, variation of impacting mass at constant height, etc. These data should be measured in a way that another experimenter at a different location could duplicate the test procedure and verify the results.

**Conclusions:** Based on the results of the testing and analysis, the proposed hypothesis should be accepted or rejected, or a revised hypothesis generated and the test results compared to the revision. The testing and analysis should continue until there is specific agreement between theory and experiment.

- E. To test the stated hypothesis and to examine if there were any alternative explanations for his being ejected, I performed the following engineering steps:
1. Detailed macroscopic study of physical evidence
  2. An examination of documents relating to other similar incidents and claims
  3. A review of technical drawings and patents for subject buckle design
  4. An inspection of other buckles both similar to and differing from subject buckle
  5. Testing of alternative and similar buckles, using standard safety belt buckle test procedures
  6. A review of research materials regarding buckle design
  7. Information regarding NHTSA investigations of other end release safety belt buckle failures
  8. Computer modeling of inertial release
  9. Documents produced by DaimlerChrysler in litigation.
- F. An examination of the above data confirms that the safety belt buckle of the type and design used in the subject Wrangler has inertially unlatched, in tests conducted by FaAA, DaimlerChrysler, the NHTSA and Clarke Automotive Consulting. It further suggests that DaimlerChrysler intended that this buckle be designed to reduce the risk of inertial separation. These buckles separate, despite additional blocking devices intended to supplement the latch spring and help keep the latch engaged with the belt tongue. This buckle is, also, not designed to minimize the risk of accidental buckle separation, in violation of FMVSS 209, S4.1e. In fact, it opens when the press button is lightly contacted by a 40 millimeter sphere, the least stringent test for inadvertent release that is widely utilized. It also easily opens when contacted by a human elbow.
- G. There are several similar designs of buckles sold worldwide. The Breed version of this buckle is the least resistant to inertial unlatch.

## V. Conclusions:

- A. Ms. Creamer lost control of subject Jeep Wrangler, due to a driver's side impact from a 1997 Chevrolet Malibu, driven by Roberto Camacho. The Wrangler, then, veered across the roadway in a clockwise yaw skid and

overturned. The Wrangler continued east while overturning at least 2 3/4 times, coming to rest on its driver's side.

- B. Ms. Warrick was wearing the available lap/shoulder safety belt, in the right rear seating position of subject Wrangler. A summary of belt use evidence is provided. (Attachment 6.) This physical evidence supports the conclusion that the belt was being worn prior to the collision. In addition, she clearly remained with the vehicle for a significant portion of the event. The above evidence is independent of any testimony, and, standing alone, demonstrates conclusively that Ms. Warrick was belted at the beginning of the accident sequence, and at least partially restrained as the vehicle overturned and she was initially partially ejected.
- C. Therefore, Ms. Warrick was wearing the available, original equipment Breed safety belt at the start of the collision.
- D. The latch plate separated from the buckle during the collision.
- E. The separation of the latch plate from the buckle was the cause of the restraint system failing to maintain her within the safer confines of the subject Jeep Wrangler during the collision.
- F. It is probable that Ms. Warrick inadvertently unlatched her buckle due to the buckle location and the unprotected push button buckle release.
- G. The safety belt restraint system buckle, which was intended to retain the driver, unlatched inadvertently, or due to inertial forces, during the course of the subject accident sequence. **Basis:** End release buckles both similar and identical to subject buckle have been tested and have inertially released, in laboratory testing conducted by Clarke Automotive Consulting and other laboratories, including in tests conducted for DaimlerChrysler and the NHTSA. (see "Proposed Exhibit List" attached) These test results are consistent with the failures in full-scale sled and crash tests conducted by automobile manufacturers and test laboratories around the world. Based on our study of the inertial release characteristics of this design of buckle, we find that multiple impact accidents greatly increase the likelihood of an inertial release. Side impact and rollover accidents such as this one are multiple impact events. During a multiple impact event, after the buckle has inertially released, the occupant is left unrestrained and derives no further benefit from the safety belt system.
- H. During the rollover sequence Ms. Warrick was ejected. His final ejection portal is uncertain; however, it is probably the left rear quarter window. **Basis:** Vehicle inspection, Ms. Warrick's rest position under the driver's side of the Jeep.

## VI. Buckle Opinions:

- A. The safety belt restraint system, utilized to restrain the right rear passenger during the subject accident, was defective in that it failed to keep her within the available survival space. The defect in the safety belt restraint system allows the restraint to work, possibly, nine times out of ten but always maintains a potential for inadvertent release leaving the user unrestrained



and unprotected. Engineering experts have demonstrated this failure to manufacturers of vehicles incorporating similar buckle designs, during litigation related proceedings and on television programs, many times over more than twenty years.

- B. Failure of an end-release buckle in this collision is predictable. All of the wheels-down impacts result in forces that will cause sharp blows to the mounting of the buckle. Since the press button is not counterbalanced, there is no design feature in the buckle to prevent unlatch under the above circumstances. I have reviewed large numbers of customer complaints of end-release buckle separation, most of which involved multiple impacts.
- C. Breed has ignored complaints of end-release buckle failure in violation of the "Engineers' Code of Ethics," (Attachment 7.) the Federal Motor Vehicle Safety Standards and plain common sense. Breed's conduct demonstrates a lack of ordinary care. Breed knew, or should have known, that the risks of injury and death to unrestrained occupants far exceed the risks to those occupants who are restrained and remain restrained throughout a collision. Breed's failure to follow failure analysis procedures and eliminate unsafe seat belt buckles doomed Ms. Warrick and many other victims to certain serious injury and, in her case, death.
- D. Subject safety belt buckle was defective and unreasonably dangerous, since it failed to meet Ms. Warrick's reasonable expectation that a safety belt was supposed to stay fastened in a collision.
- E. Further, subject safety belt buckle failed to meet the letter of the applicable Federal Motor Vehicle Safety Standards. Specifically, it failed to meet FMVSS 209 S4.1e, "...Buckle release mechanism shall be designed to minimize the possibility of accidental release..." Many safety belt buckle designers have addressed the problem of accidental release, particularly accidental release due to inadvertent occupant contact. (Attachment 8.)

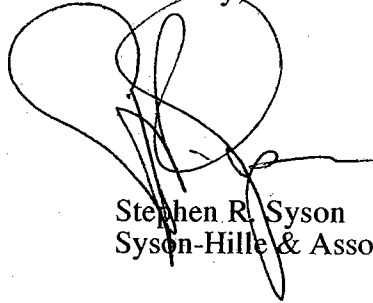
## VII. Alternative Buckle Designs:

- A. Economically and technologically feasible alternative designs were available to Breed to provide for use in the Jeep Wrangler. The use of such alternative designs would have prevented both the inertial and inadvertent failure modes.
- B. These included designs are represented by:
  - 1. The blocked side release buckle designs used by GM in the Corvette and Luv truck, and by Ford in the Taurus and Courier pickup.
  - 2. Buckles with "counterbalanced" mechanisms, including Breed buckles, that have been patented by various buckle manufacturers, including Breed, since the 1960's.
  - 3. Buckles with press buttons that are shielded to minimize the risk of inadvertent unlatch, including buckles manufactured by Breed.
  - 4. Each of the above design concepts eliminates or drastically reduces the potential for one or more of the known failure modes.
- C. The Breed buckle design in question poses the potential for critical failure of the buckle during collisions, resulting in avoidable death or serious bodily



injury; a potential which would/could have been eliminated by economically and technologically feasible alternative designs. It is, therefore, my opinion that the design is defective.

Sincerely,



Stephen R. Syson  
Syson-Hille & Assoc.

## BUCKLE REFERENCES

Andreatta, Dale, Wiechel, J.F., MacLaughlin, T.F. and Guenther, D.A., "An Analytical Model of the Inertial Opening of Seat Belt Latches," Society of Automotive Engineers (SAE) Paper No. 960436, 1996.

Arndt, Stephen M.; Mowry, Gregory A.; Arndt, Mark W., "Characterization of Automotive Seat Belt Buckle Inertial Release," 37th Annual Proceedings, Association of the Advancement of Automotive Medicine; November 4-6, 1993.

Australia Department of Transportation, Design Rule No. 4A, Section 4.2.5 - Clause 4.3; Section 4.2.6.1; Section 4.2.6.2; February 1973.

Bayer, Anthony R.; Kirkbride, Russel L., Jr., "Survey of Seat Belt Latching Mechanisms Used on 1971-78 Passenger Cars," Final Report; NHTSA, 1978.

Bayer, Anthony R.; Kirkbride, Russel L., Jr., "Tests of 1975 Chevrolet Monza Seat Belt Latching Mechanisms," Final Report; NHTSA, 1979.

Blick, Edward F. and Harcourt, John A., "Why Do Seat Buckles Inertially Unlatch in Car Crashes?" ASME, February 22, 1997.

Chiang, George; Ostrosky, Edward; "Memo re: Alleged Failure of Seat Belt Buckle on 1975 Chevrolet Monza 2+2," Safety Defects Engineers; Engineering Analysis Division NHTSA; October 24, 1979.

Desjardins, S.P.; Laananen, D.H.; Singley, G.T., III, Aircraft Crash Survival Design Guide: Vol 1 - Design Criteria & Checklists, Simula Inc., Final Report, AVRADCOM, Sept 1977 - Aug 1980.

Detrick, A.G., "Alleged Monza Seat Belt Problem," NHTSA: Letter dated June 6, 1977.

Hearings before the Committee on Interstate and Foreign Commerce, "Second Session of H.R. 13228 and Other Bills Relating to Traffic Safety," March 15-17, April 26-28, May 3-5, 10-13, 1966.



Herbert, David; Davis, Terrence O.; Vaughan, Rodney G.; Vazey, Brian A., "Dynamic Tests for Seat Belts," Department of Motor Transport, New South Wales, 1973.

Heather, Michael B.; Allsop, Douglas L.; Perl, Thomas R.; Struble, Donald E., "Inertial Seat Belt Release," SAE Technical Paper No. 930641, 1993.

Johnson, Charles, "Ford Motor Company Test Series T-1999 and T-2045," Sled Tests, July 5, 6, & 7, 1972; July 20 & 21, 1972.

Lee, Kwangho, "The Influence of Belt Tension on Buckle Response During Car Crash," SAE: Technical Paper No. 932914, 1993.

Maripudi, Vivek, Petersen, Carl and Gill, Harjeet, "Simulation of Seatbelt Mechanism in CATIA," <http://www.cadsi.com/Gallery/Casestudy/seatbelt.htm>, BREED, 1999.

Moffatt, Edward A., Thomas, Terry M. and Cooper, Eddie R., "Safety Belt Buckle Inertial Responses in Laboratory and Crash Tests," SAE Paper No. 950887, 1995.

Sances, Anthony Jr., "Biomechanical Analysis of Restraint Receptacles," ASME, 1998.

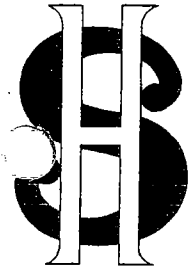
Sances, Anthony Jr., Friedman, Kieth, Gaston, Fiona, Bish, Jack and Rogers, Chuck, "Experimental Investigation and Finite Element Analysis of Vehicle Restraint Systems," ASME 1999.

Vulcan, A.P.; Ungers, R.; Milne, P.W., "Australian Approach to Motor Vehicle Safety Standards," Fourth International Congress on Automotive Safety; July 14-16, 1975.

#### **ATTACHMENTS:**

1. Resumes for Stephen R. Syson
2. Billing Rate Schedule
3. List of Publications
4. List of Mr. Syson's recent testimony
5. Proposed Exhibit List
6. Belt Use Evidence
7. Engineers' Code of Ethics
8. Patents addressing inadvertent unlatching

## **Attachment 1.**



**SYSON-HILLE  
and  
ASSOCIATES**

Engineering Services  
Since 1982

**STEPHEN R. SYSON**

**TECHNICAL AREAS OF SPECIALIZATION:**

Accident Reconstruction  
Defects Investigation  
Air Bag System Analysis

Vehicle Handling and Safety  
Rollover Probability Studies  
Restraint System Analysis

Crashworthiness  
Vehicle Structures  
Occupant Motion

**EDUCATION:**

General Motors Institute - Bachelor of Mechanical Engineering (1970)

Case Western Reserve University: (Case Institute of Technology)  
- Master's Degree in Engineering (1970)

**PROFESSIONAL EXPERIENCE:**

Senior Project Engineer, Safety Research and Development Lab, General Motors Proving Grounds.  
Research Engineer, General Motors Design Staff.

Head of Structures and Engineering, Minicars, Inc.

Design: Vehicle components for improved crashworthiness including; belt restraint systems, air cushion restraint systems, steering columns and column installation hardware, and front, side, and roof structures at General Motors and Minicars. Continuous involvement in the design of racing cars.

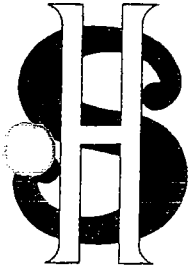
Testing: Conducted vehicle and component tests and analyzed test data for General Motors and Minicars. Tests included frontal barrier impact crash tests, sled tests of restraint systems, and static and dynamic tests to reconstruct traffic accidents for the support of defense and plaintiff attorneys in litigation.

Accident Reconstruction and Product Defects: Reconstruction of traffic accidents involving automobiles and light trucks for General Motors, and as an independent expert, with primary emphasis on enhancement of injury by defective product design and/or manufacture, also determination of legal cause of collision.

Society of Automotive Engineers, Member of the American Academy of Forensic Sciences.

**MEMBERSHIPS:**

Society of Automotive Engineers  
American Society of Mechanical Engineers  
American Academy of Forensic Sciences  
Association for the Advancement of Automotive Medicine  
Alpha Tau Iota, Honorary Engineering Fraternity



SYSON-HILLE  
and  
ASSOCIATES

Engineering Services  
Since 1982

Stephen R. Syson

EDUCATION:

General Motors Institute, BSME -Automotive, 1970  
Case Western Reserve university, MS - Engineering, 1970

EXPERIENCE:

Syson - Hille and Associates, Goleta, California 1982 - Present

General Partner. Performs analysis of motor vehicle collisions with emphasis on vehicle crashworthiness and restraint system performance.

MCR Technology, Inc., Goleta, California 1978 - 1982

Head, Engineering and Design Groups. Supervised and conducted analysis and design of vehicle structures, utilizing both lumped mass simulation of vehicle crashes and finite element modeling of structural systems. Responsible for structural design of the Paratransit Vehicle (Taxi for Handicapped Passengers) and the Large Research Safety Vehicle. Conducted dynamic analysis of motor vehicle ride, handling and braking, and developed vehicle design criteria.

General Motors, Safety Research and Development, General Motors Proving Grounds, Milford, Michigan 1971- 1978

Senior Project Engineer. Directed program to validate the technique of modeling vehicle front structures by lumped masses and non-linear springs. Revised front structure static testing. Used computer simulations correlated with test results to develop both active and passive belt restraint systems. Set up test protocol for HYGE sled, laboratory, and barrier tests to evaluate vehicle restraint system performance. Supervised and conducted development of advanced air cushion restraint systems for various GM vehicles.

MEMBERSHIPS:

Society of Automotive Engineers  
American Academy of Forensic Sciences  
Alpha Tau Iota, Honorary Engineering Fraternity  
Association for the Advance of Automotive Medicine  
American Society of Mechanical Engineers

## **Attachment 2.**

## **SYSON-HILLE & ASSOCIATES**

### Hourly Fees:

All services provided are billed on an hourly basis at the current rate of the staff member(s) assigned.

1. Hours are billed:
  - a. portal to portal;
  - b. with a minimum billing increment of one-half hour;
  - c. uniformly without regard to the services provided.
  - d. at one and one half times for weekends and holidays
  
2. SYSON-HILLE Consulting Rates (Hourly)

	Standard	Weekends/ Holidays
a. <i>Stephen R. Syson</i>	\$300	\$450
b. <i>Richard A. Hille</i>	\$215	\$322.50
c. Technician	\$75 to 100	\$150.00
d. Administrative	\$30 to 70	\$105.00

This hourly rate is subject to upward revision in the event  
SYSON-HILLE has a general fee increase.

### **EXPENSES (Incurred as a result of authorized activities)**

All ordinary and necessary costs are full reimbursable at cost plus a 20% administration fee. Automobile mileage is billed at \$.80/per mile. There will be a \$100.00 fee upon opening a case.

## **Attachment 3.**

### Syson Papers Authored:

"The Minicars Research Safety Vehicle Program Phase III"; Volumn I; Technical Final Report; DOT-HS-7-01552; D. Struble; V. Ausherman; C. Strother; A. Khadilkar; S. Syson; September 1981

"Paratransit Vehicle Prototype Development, Tasks I and II"; Final Report; DOT-UT-90046; Minicars; D. Struble, A. Khadilkar; S. Syson; Nov. 1981

"A Study of Steering Assemblies for Evaluation, Rating, and Improvements of Safety Performance" DOT HS 806 665; Final Report; Minicars; N. Hanneman, S. Syson; June 1982

"Design and Development of a Modified Production Vehicle for Enhanced Crashworthiness and Fuel Economy" Technical Proposal; P-1752-06-30-T; S. Syson; A. Khadilkar; G. Wallace; C. Strother; June, 1980

"Design and Development of a Modified Production Vehicle for Enhanced Crashworthiness and Fuel Economy" Phase I Final Report; DTHN22-81-C-07085; N Hannemann; R. Schwartz; D. Struble; S. Syson; G. Wallace; S. Forest; October, 1982

"Field Accident Evaluations and Experimental Study of Seat Back Performance Relative to Rear-Impact Occupant Protection"; SAE #930346; K. Saczalski; S. Syson; R. Hille; M. Pozzi

"Occupant to Roof Contact: Rollovers and Drop Tests"; SAE #950654; S. Syson

"Beyond Whiplash: Impact Evidence in Severe Spinal Injury" 1999 International Mechanical Engineering Congress & Exposition; ASME; November 1999

"Roof Strength: A Factor in Rollover Injuries" ASME; November 2000

"Kinematics, Injury Mechanisms and Design Considerations for Older Children in Adult Torso Belts" M. Bidez; S. Syson; SAE 2001-01-0173

"Restraints and Occupant Kinematics in Vehicular Rollovers"; S. Meyers, b. Herbst, S. Forrest, S. Syson, A. Sances, Jr., S. Kumaresan; Biomedical Sciences Instrumentation; Vol. 38, p465-469, 2002

"Hybrid III Test Dummy Cranial Impacts"; Stephen Syson; Biomedical Engineering: Recent Developments; ISBN 1-930636-01-6

"Analysis of Side Release Motor Vehicle Seat Belt Buckles": R. Clark, S. Syson, A. Sances, Jr., S. Kumaresan; Scientific Program for Southern Biomedical Engineering Conference; September 26, 2003

"Hybris III Test Dummy Neck Stiffness"; S. Syson; Scientific Program for Southern Biomedical Engineering Conference; September 26, 2003

"A Scientific Analysis of Rollover Neck Loading"; S. Syson; Scientific Program for Southern Biomedical Engineering Conference; September 26, 2003

## Presentations by Stephen R. Syson

"I'm Sure I Had the Seat Belt on..."; presented to American Academy of Forensic Sciences meeting 2/17/1989

"Seat Belt Performance, Evaluation, et.al." presented to American Academy of Forensic Sciences 1990 Annual Meeting

"Seat Belt Buckle Separation: Fact or Fiction"; presented to American Academy of Forensic Sciences meeting 2/13-18/1995

"Occupant to Roof Contact: Rollovers and Drop Tests"; presented to SAE meeting 2/27/1995 – 3/7/1995

"Problems Encountered with Passive Restraints"; presented to SAE Top Tec meeting 5/4-5/1995

"Sunvisor Presentation"; presented to American Academy of Forensic Sciences meeting 2/9-14/1998

"Vehicle Crashworthiness" presented to the University of Northern California; 5/30-31/1998

"Beyond Whiplash"; presented to American Society for Mechanical Engineers: 11/14-19/1999

"Roof Strength: A Factor in Rollover Injuries"; presented to American Society for Mechanical Engineers: 11/5-10/2000

"Engineering Analysis of an End-Release Safety Belt Buckle"; presented to American Society for Mechanical Engineers; 11/11-16/2001

"The Diving Hypothesis"; presented to American Academy of Forensic Sciences meeting 2/11-16/2002

"Hybrid III Test Dummy Cranial impacts" Biomedical Engineering: Recent Developments Conference, Sept. 28-29, 2002

## **Attachment 4.**

**Testimony of Stehen Syson  
Four Years Through 10/2004**

Date of Testi- mony	Case Name	Case Number	Deposition or Trial	Venue
7/01	Abercrombie v. Nissan	CV-99-849	Deposition	Circuit Court of Morgan County, AL
8/01	Amell v. Ford	CV 98-08236	Deposition	Superior Court of Arizona Maricopa County
9/01	Amell v. Ford	CV 98-08236	Deposition	Superior Court of Arizona Maricopa County
10/01	Amell v. Ford	CV 98-08236	Deposition	Superior Court of Arizona Maricopa County
10/01	Amell v. Ford	CV 98-08236	Deposition	Superior Court of Arizona Maricopa County
4/02	Amell v. Ford	CV 98-08236	Deposition	Superior Court of Arizona Maricopa County
5/03	Azocar v. Ford	2001-03-1322-G	Deposition	District Court of Cameron County, Texas 40 <sup>th</sup> Judicial District
12/00	Bailey v. Ford	00-2303-A	Deposition	District Court, Nueces County, Texas 28 <sup>th</sup> Judicial District
11/02	Beach v. Toyota		Deposition	
12/02	Benavides v. General Motors	C2956-95-B	Deposition	District Court, 93 <sup>rd</sup> Judicial District Hidalgo county, Texas
8/01	Blackmon v. Ford	99-07073	Deposition	Circuit Court of the 13 <sup>th</sup> Judicial Circuit In and for Hillsborough County, Florida
9/01	Braton v. Ford		Deposition	
5/04	Breen v. Ford	1:02CV455-P-D	Deposition	U.S. District Court for Northern District of Mississippi Eastern Division
4/04	Brewster v. Hyundai	2-03CV-184-TJW	Deposition	U.S. District Court for the Eastern District of Texas; Marshall Division
7/04	Brewster v. Hyundai	2-03CV-184-TJW	Trial	U.S. District Court for the Eastern District of Texas; Marshall Division
1/03	Brody v. Boward Co. Sheriff's Office	01-003925 (21)	Deposition	Circuit court of the 17 <sup>th</sup> Judicial Circuit In And For Broward County Florida

5/03	Brymer v. Ford	2-02CV-155 TJW	Deposition	U.S. District Court for the Eastern District of Texas Marshall Division
7/02	Buckley v. General Motors	00CC-003492H CV Division No. 20	Deposition	Circuit Court of the County of St. Louis
4/04	Bushong v. Nissan	02CV63	Deposition	State of Missouri
8/02	Carden v. General Motors	CV 766404	Deposition	State of Wisconsin; Circuit Court Branch Oneida County
10/02	Carden v. General Motors	CV 766404	Deposition	California Superior Court County of Santa Clara
3/03	Castaneda v. Dorel	2-02CV-74-TJW	Deposition	California Superior Court County of Santa Clara
7/02	Chesnut v. DaimlerChrysler	155,133-B	Deposition	U.S. District court for the Eastern District of Texas Marshall Division
5/02	Cintron v. Kia	99-10499 AN	Deposition	District Court, 78 <sup>th</sup> Judicial District Wichita County, Texas
7/02	Cintron v. Kia	99-10499 AN	Deposition	Circuit Court of the 15 <sup>th</sup> Judicial Circuit in and for Palm Beach County, FL
8/02	Cintron v. Kia	99-10499 AN	Deposition	Circuit Court of the 15 <sup>th</sup> Judicial Circuit in and for Palm Beach County, FL
6/01	Cliburn v. Ford	99-0280	Trial	Circuit Court of the 15 <sup>th</sup> Judicial Circuit in and for Palm Beach County, FL
6/03	Cockroft v. General Motors	2001-2-9181	Deposition	Circuit Court of Holmes County, Mississippi
9/04	Cockroft v. General Motors	2001-2-9181	Deposition	267 <sup>th</sup> Judicial District Court of Refugio County, Texas
8/01	Cornish v. Nissan	62385	Trial	267 <sup>th</sup> Judicial District Court of Refugio County, Texas
2/02	Cornish v. Nissan	62385	Deposition	196 <sup>th</sup> Judicial District District Court of Hunt County, Texas
5/03	Corona v. Ford	C-1350-01-F	Trial	District Court, 332 <sup>nd</sup> Judicial District Hidalgo County, Texas
8/03	Corrigan v. Toyota	BC241885	Deposition	Superior Court of the State of California of the Co. of Los Angeles Central District
1/04	Corrigan v. Toyota	BC241885	Deposition	Superior Court of the State of California of the Co. of Los Angeles Central District
11/01	Davis v. Ford	CV-N-0-0556-HDM-RAM	Deposition	U.S. District Court; District of Nevada

12/00	Donnett v. National Car Rental	98-0061	Deposition	Circuit Court of the Fifth Circuit State of Hawaii
8/02	Duhon v. Ford	E-157,171	Deposition	District Court Jefferson County, TX 172 <sup>nd</sup> Judicial District
6/04	Dwelle v. Ford	01-001812-CA-01	Deposition	Circuit court of the 1 <sup>st</sup> Judicial Circuit Escambia County, Florida
10/03	Elias v. Ford	2002C118124	Deposition	288 <sup>th</sup> Judicial District Bexar County, Texas
2/01	Evans v. Chrysler	Doc 968, No. 554	Deposition	District Court of Douglas, Nebraska
6/02	Evans v. Nissan		Deposition	
7/04	Fisher v. Ford	2:03CV-06220	Deposition	U.S. District Court Eastern District of Pennsylvania
7/02	Fontenot v. General Motors	22800AMG	Deposition	9 <sup>th</sup> Judicial District, Parish of Rapides State of Louisiana
1/01	Ford v. Ford	CV97-10422	Trial	Superior Court of State of Arizona In and for the County of Maricopa
2/01	Fuqua v. Ford	CV-199-3464-CC	Deposition	Circuit Court of the County of Jefferson State of Missouri
3/01	Gibbins v. Goodyear	99C-01625	Deposition	Superior Court of the State of California County of Contra Costa
10/01	Gilroy v. Ford	17,914	Deposition	District Court of Morris County, Texas 76 <sup>th</sup> Judicial District
9/01	Girley v. Subaru	V 015121-8	Deposition	Superior Court of State of California, County of Alameda
10/01	Girley v. Subaru	V 015121-8	Deposition	Superior Court of State of California, County of Alameda
5/01	Green v. Ford	2:00CV210-TH	Deposition	369 <sup>th</sup> District Court Anderson County, Texas
8/01	Granda v. Ford	CV 98000911	Deposition	Superior Court of California County of Yolo
10/04	Green v. Ford	CV-2003-1794	Deposition	Circuit Court of Madison County, Alabama
7/02	Greenwood v. Honda	CV 99-22663	Deposition	Superior Court of the State of Arizona in and for the County of Maricopa
2/03	Greenwood v. Honda	CV 99-22663	Trial	Superior Court of the State of Arizona in and for the County of Maricopa
3/03	Greenwood v. Honda	CV 99-22663	Trial	Superior Court of the State of Arizona in and for the County of Maricopa

9/03	Gutierrez v. Ford	2001-12-5233-B	Deposition	District Court, 138 <sup>th</sup> Judicial District Cameron County, Texas
4/01	Gwyn v. General Motors	99-09-3741-A	Deposition	District Court of Cameron County, Texas 107 <sup>th</sup> Judicial District
4/01	Gwyn v. General Motors	99-09-3741-A	Trial	District Court of Cameron County, Texas 107 <sup>th</sup> Judicial District
2/01	Harris v. Ford	GLO-L_1728-98	Deposition	Superior Court of New Jersey Law Division County of Gloucester
6/01	Harris v. Ford	GLO-L-1728-98	Deposition	Superior Court of New Jersey Law Division County of Gloucester
5/04	Heikke v. Suzuki	CT 03-004057	Deposition	State of Minnesota, Co. of Hennepin District Court, 4 <sup>th</sup> Judicial District
8/04	Heikke v. Suzuki	CT 03-004057	Deposition	State of Minnesota, Co. of Hennepin District Court, 4 <sup>th</sup> Judicial District
8/03	Heinricks v. Nissan	CC-01-07566-A	Deposition	In the County Court at Law No. 1 Dallas County, Texas
3/04	Henderson v. Ford	2-03-CV-167	Deposition	U.S. District Court for the Eastern District of Texas, Marshall Division
4/04	Henderson v. Ford	2-03-CV-167	Trial	U.S. District Court for the Eastern District of Texas, Marshall Division
9/01	Hirata v. Toyota	00-1-2099-07	Deposition	Circuit Court of the 1 <sup>st</sup> Circuit State of Hawaii
1/02	Hirata v. Toyota	00-1-2099-07	Trial	Circuit Court of the 1 <sup>st</sup> Circuit State of Hawaii
3/04	Hodges v. Indiana Mills	2-03CV-183-LD	Deposition	U.S. District Court for the Eastern District of Texas, Marshall Division
8/04	Hodges v. Indiana Mills	2-03CV-183-LD	Trial	U.S. District Court for the Eastern District of Texas, Marshall Division
6/04	Holliday v. Ford	454330	Deposition	Court of Common Pleas Cuyahoga County, Ohio
11/03	Hook v. Isuzu	5:03-CV-157-H(3)	Deposition	U.S. District Court for the Eastern District of No. Carolina; Western District
8/04	Hunter v. Suzuki	03-01-01464RB/LCS	Deposition	U. S. District Court for the District of new Mexico
9/02	Johnson v. Ford	CV 2001-116	Deposition	Circuit court of Macon Co., Alabama
7/02	Jones v. Ford	No. 74,600-A	Deposition	Probate Court Number One of Travis County, Texas

7/02	Jordan v. Honda	not available	Deposition	not available
11/03	Kaye v. Ford	01-C-417-S	Deposition	Circuit Court of Mercer Co., W. Virginia
11/03	Kendall v. Ford	D 1329 CV 010617	Deposition	State of New Mexico; County of Sandoval 13 <sup>th</sup> Judicial District Court
3/04	King V. General Motors	21,829-C	Deposition	District Court, Walker County, Texas
9/03	Kreiensteck v. Saab	not available	Trial	not available
10/03	Kreiensteck v. Saab	not available	Trial	not available
8/04	Lopez v. General Motors	17-197104-03	Deposition	District Court of Tarrant Co, Texas 17 <sup>th</sup> Judicial District
2/02	Lozano v. Daimlerchrysler	01-2090-A	Deposition	District Court, 28 <sup>th</sup> Judicial District Nueces County, Texas
12/01	MacFarlane v. Indiana Mills	2-00-CA-634	Deposition	U.S. District Court District of Utah, Central Division
10/01	Magana v. Hyundai	00-2-00553-2	Deposition	Superior Court of Washington For Clark County
11/01	Magana v. Hyundai	00-2-00553-2	Deposition	Superior Court of Washington For Clark County
6/02	Magana v. Hyundai	00-2-00553-2	Trial	Superior Court of Washington For Clark County
9/04	Mariscal v. General Motors	03-06600-M	Deposition	District Court of Dallas County, TX 298 <sup>th</sup> Judicial District
12/00	May v. General Motors	98-CI-00376	Deposition	Circuit Court of Floyd County, Kentucky
11/01	McNabb v. General Motors	96-3906-NP	Deposition	State of Michigan Circuit Court for the County of Macomb
5/04	Mead v. Ford	03-H-0089-C	Deposition	District Court Matagorda Co, Texas 23 <sup>rd</sup> Judicial District
1/03	Medina v. Sanchez, Jr; et al.	2001-08-3741-B	Deposition	District Court, Cameron County, Texas 138 <sup>th</sup> Judicial District
2/03	Miles/Searcy v. Ford		Trial	
7/04	Miller v. Toyota	2:03-CV-188-TJW	Deposition	U.S. District Court Eastern District of Texas, Marshall Division
7/04	Mitchell v. Ford	MID-L-5453-02	Deposition	Superior Court of New Jersey Law Division - Middlesex County
11/01	Morgan v. General Motors	5:00CV195-R	Deposition	U.S. District Court Western District of Kentucky Paducah Division

11/02	Morgan v. General Motors	5:00CV195-R	Deposition	U.S. District Court Western District of Kentucky Paducah Division
4/04	Morrix v. Ford	CV2003-002298	Deposition	Superior Court of the State of Arizona In and For the County of Maricopa
3/04	Muniz v. General Motors	02-11-18802-MCV	Deposition	District Court; 293 Judicial District Maverick County, TX
1/04	Murillo v. General Motors	03 C 2652	Deposition	U.S. District Court for the Northern District of Illinois - Eastern Division
6/04	Newsome v. General Motors	99-3815	Court Hearing	County Court at Law, Number Five El Paso County, Texas
10/04	Newsome v. General Motors	99-3815	Deposition	County Court at Law, Number Five El Paso County, Texas
1/03	Norm v. Honda	1:01 CV-1477-TWT	Deposition	U.S. District Court for the Northern District of Georgia; Atlanta Division
6/03	Oandasan v. Kapapala Ranch	01-1-0494 (Hilo)	Deposition	Circuit Court of the 1 <sup>st</sup> Circuit State of Hawaii
8/03	Oandasan v. Kapapala Ranch	01-1-0494 (Hilo)	Deposition	Circuit Court of the 1 <sup>st</sup> Circuit State of Hawaii
9/01	Paiz v. General Motors	93-101-01-F	Deposition	In the District Court of Dallas Co., Texas, 116th Judicial District
8/03	Paiz v. General Motors	93-101-01-F	Trial	In the District Court of Dallas Co., Texas, 116th Judicial District
11/00	Palka v. General Motors	98 L 8737	Deposition	Circuit Court of Cook County, Illinois County Department, Law Division
3/03	Pelfort v. General Motors	00-33220 (CA 15)	Deposition	Circuit Court of the 11 <sup>th</sup> Judicial Circuit in and for Miami-Dade County, Florida
9/03	Pelfort v. General Motors	00-33220 (CA 15)	Deposition	Circuit Court of the 11 <sup>th</sup> Judicial Circuit in and for Miami-Dade County, Florida
11/00	Pennington v.	1999-31168	Deposition	281 <sup>st</sup> Judicial District Harris County, Texas
2/01	Pennington v.	1999-31168	Trial	281 <sup>st</sup> Judicial District Harris County, Texas
9/04	Perry v. Toyota	CC-03-03594-C	Trial	County Court of Dallas County, TX
9/04	Plaisance v.	03-2596	Deposition	U.S. District Court, Eastern District of Louisiana, New Orleans Division

8/02	Poirier v. Ford	74,600-A	Deposition	Probate Court Number One (1) Travis County, TX
10/02	Poirier v. Ford	74,600-A	Trial	Probate Court Number One (1) Travis County, TX
3/01	Pressley v. General Motors	2000-29994	Deposition	District Court of Harris County, Texas 55 <sup>th</sup> Judicial District
4/02	Rafferty v. Ford	96-18266	Deposition	Court of Common Pleas of Allegheny County Pennsylvania Civil Division
6/02	Rafferty v. Ford	96-18266	Deposition	Court of Common Pleas of Allegheny County Pennsylvania Civil Division
8/03	Reed/Russ v. Ford	CV013705	Deposition	Superior Court of the State of California for the Co. of San Joaquin
9/03	Reed/Russ v. Ford	CV013705	Deposition	Superior Court of the State of California for the Co. of San Joaquin
11/01	Ricci v. Volvo	CV-N-00-0088-ECR- RAM	Deposition	U.S. District Court District of Nevada
7/02	Ricci v. Volvo	CV-N-00-0088-ECR- RAM	Deposition	U.S. District Court District of Nevada
12/02	Ricci v. Volvo	CV-N-00-0088-ECR- RAM	Deposition	U.S. District Court District of Nevada
1/03	Ricci v. Volvo	CV-N-00-0088-ECR- RAM	Trial	U.S. District Court District of Nevada
11/02	Robinson v. Toyota		Deposition	
10/01	Roland v. Ford	00C0816-102	Deposition	District Court, Bowie County, Texas 102 <sup>nd</sup> Judicial District
2/02	Roland v. Ford	00C0816-102	Trial	District Court, Bowie County, Texas 102 <sup>nd</sup> Judicial District
12/01	Roper v. Ford	CV98-918	Deposition	Circuit Court of Calhoun County, Alabama
7/02	Russell v. Ford	CV 01-C-1759-S	Deposition	U.S. District Court for the Northern District of Alabama Southern Division
9/02	Russell v. Ford	CV 01-C-1759-S	Deposition	U.S. District Court for the Northern District of Alabama Southern Division
11/03	Scales v. Nissan	1:02CV0234	Deposition	U.S. District Court; Eastern District of Texas; Beaumont Division
8/01	Schultz v. Ford	49D13-9912-CT- 1835	Deposition	Marion superior Court of Indiana Civil Division

10/03	Shubert v. Honeywell	2:02-cv-00299-TJW	Deposition	U.S. District Court, Eastern District of Texas, Marshall Division
3/03	Shumaker v. Ford	01C-07-018-1-CV RRC	Deposition	Superior Court of the State of Delaware in and for New Castle County
6/04	simon v. General Motors	03CV0724	Deposition	State of Wisconsin, Circuit Court Dane County, Branch 8
1/01	Snell v. General Motors	C.A. No. H-99-2457	Deposition	U.S. District Court; Southern District of Texas Houston Division
10/01	Sprong v. General Motors	00 CV 172	Deposition	State of Wisconsin, Circuit Court St. Croix County
12/01	Sprong v. General Motors	00 CV 172	Deposition	State of Wisconsin, Circuit Court St. Croix County
10/02	Sprong v. General Motors	00 CV 172	Trial	State of Wisconsin, Circuit Court St. Croix County
12/03	Taylor v. General Motors	01-WM-1268	Deposition	U.S. District Court for the District of Colorado
5/04	Teters v. Ford	02-755	Deposition	District Court of Commanche County, State of Oklahoma
12/00	Tilley v. Toyota	96CV0244	Trial	District Court of Galveston County, TX 212th Judicial District
6/02	Trott v. Indiana Mills	CV-01-PWG-157-S	Deposition	U.S. District Court for the Northern District of Alabama Southern Division
1/04	Vaughn v. DaimlerChrysler	01-CI-00362	Deposition	Commonwealth of Kentucky Clay Circuit Court
7/01	Walker/Rainford v. Ford	CL 99-9311 AI	Deposition	15 <sup>th</sup> Judicial Circuit Court in and for Palm Beach County, Florida
3/04	Warner v. General Motors	DV 03-261	Deposition	Montana 18 <sup>th</sup> Judicial District Court Gallatin County
5/03	Wheeler v. Ford	01-CP-32-0656	Deposition	State of S. Carolina, County of Lexington Corut of Common Pleas, 11 <sup>th</sup> Circuit
9/03	Wheeler v. Ford	01-CP-32-0656	Deposition	State of S. Carolina, County of Lexington Corut of Common Pleas, 11 <sup>th</sup> Circuit
11/02	Wilkins v. Ford	01-CV-931E(J)	Deposition	U.S. District Court for Northern District of Oklahoma
7/04	Wuetcher v. General Motors	01-CI-03118	Deposition	Commonwealth of Kentucky Jefferson circuit Court, Division 12

## **Attachment 5.**

## **Proposed Inertial Unlatching Exhibits**

Ford tests with modified buckles circa 1965  
Joint GM/Ford "Seat Belt Safety Presentation"  
Bugas' comments to Ribicoff  
Customer complaints  
Lawsuits/jury verdicts  
OSI's from Wiitala and Bradley  
NHTSA 1978 seat belt buckle investigations  
Ford/Eaton air bag tests  
Ford tests of Australian Ford buckles  
Other Ford crash and sled tests produced in Wiitala  
California Highway Patrol belt tests circa 1965

ALL testing of the RCF67 buckle and clones:

Ford (produced in Wiitala, Blakovich)  
Arndt  
TRC  
Peterson  
ARCCA  
FaAA  
CSE  
Syson - Hille  
Willis Labs  
EMTEC  
David Biss  
Tony Sances

Patents:

Subject buckle  
Other buckles designed to remain latched in collisions

Testing of other buckle designs, including alternative  
designs used by Ford:

Taurus  
1981 European Escort  
Firebird/Autoflug Buckle  
Celica/LUV/Ford Courier Buckle

Video deposition of Roger Saul

Human Body Testing:

FaAA  
TRC  
Syson - Hille

**Proposed Inertial Unlatching Exhibits (Con't)**

1981 European Ford Escort Buckle

Firebird/Autoflug Buckle

Ford European GPAS for buckles

Current Ford U.S. buckle spec.

Ford buckle purchasing spec. for Taurus, etc.

Padded rubber mallet

BMW purchasing spec. for buckles (Pfabe deposition)

Ford OSI's:

Trail

Belhomme

Hoch

Viers

Miller

deBlanc

Kehm

Lam

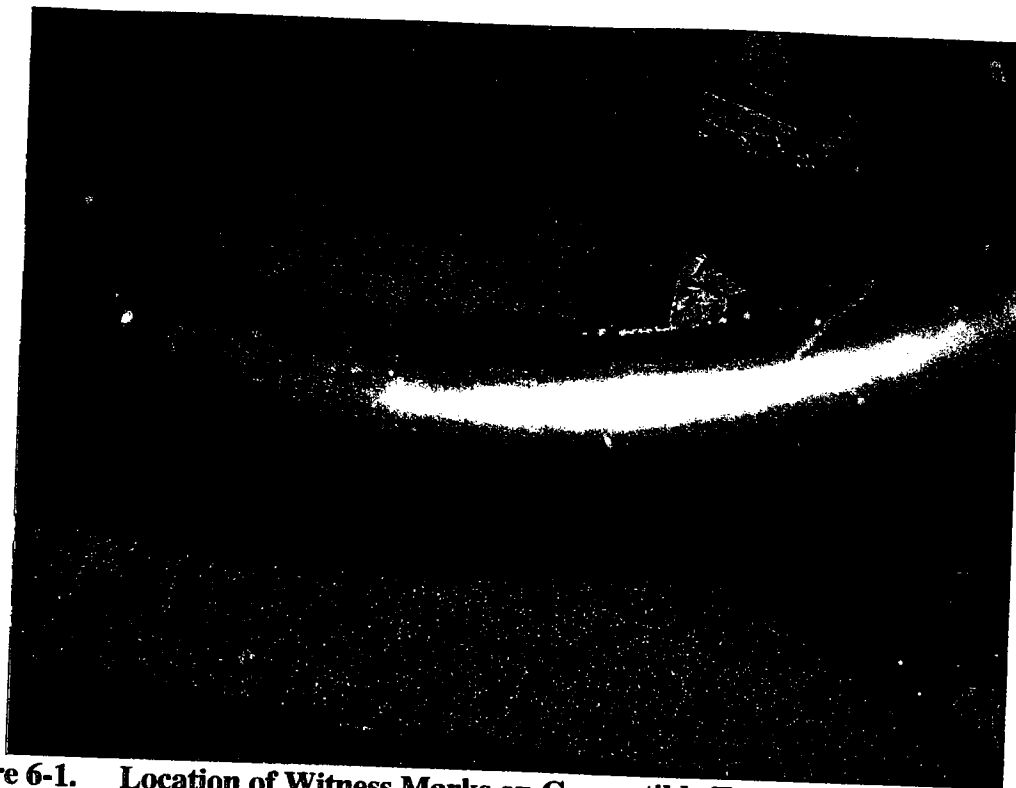
Blakovich

Millsom

Etc., etc....

## **Attachment 6.**

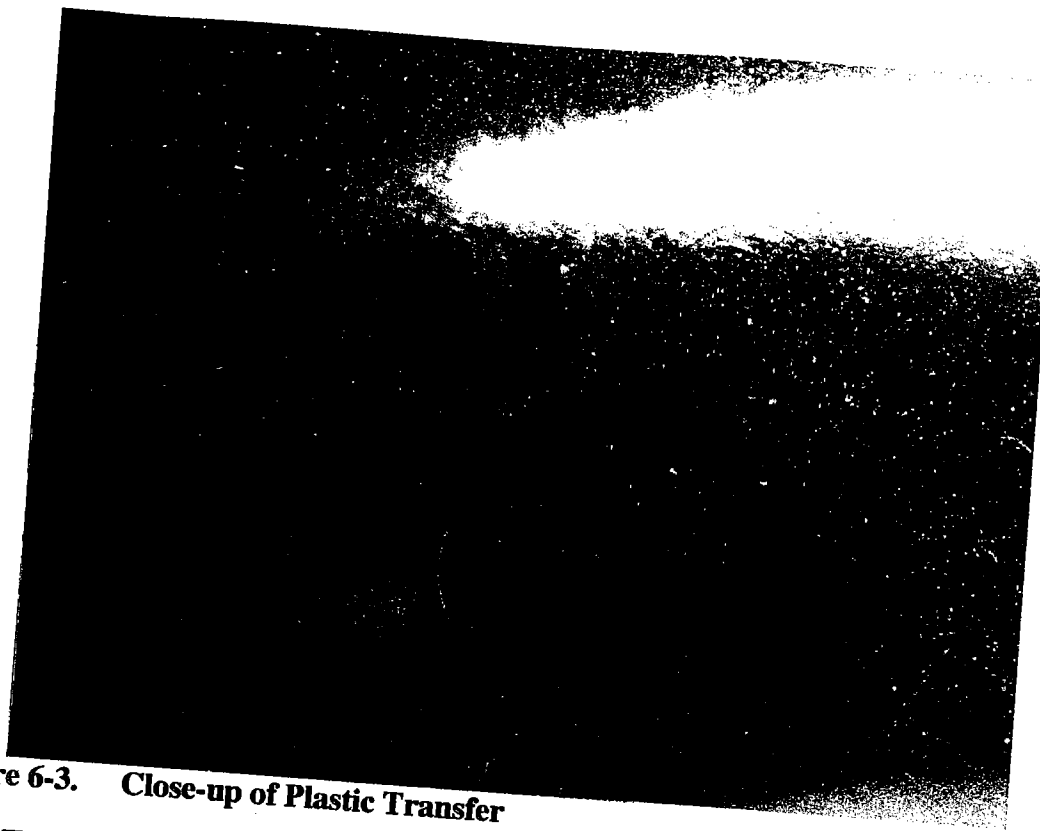
### **Warrick Belt Use Evidence**



**Figure 6-1. Location of Witness Marks on Convertible Top Brace**



**Figure 6-2. Plastic Transfer from Latch Plate**



**Figure 6-3. Close-up of Plastic Transfer**



**Figure 6-4. Transfers from Safety Belt Fabric to Convertible Top Bar**

## **Attachment 7.**

# **SOCIETY POLICY**

## **ETHICS**

---

ASME requires ethical practice by each of its members and has adopted the following Code of Ethics of Engineers as referenced in the ASME Constitution, Article C2.1.1.

### **CODE OF ETHICS OF ENGINEERS**

#### **The Fundamental Principles**

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

- I. Using their knowledge and skill for the enhancement of human welfare;
- II. Being honest and impartial, and serving with fidelity the public, their employers and clients; and
- III. Striving to increase the competence and prestige of the engineering profession.

#### **The Fundamental Canons**

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional and ethical development of those engineers under their supervision.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest or the appearance of conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall associate only with reputable persons or organizations.
7. Engineers shall issue public statements only in an objective and truthful manner.
8. Engineers shall consider environmental impact in the performance of their professional duties.



## THE ASME CRITERIA FOR INTERPRETATION OF THE CANONS

The ASME criteria for interpretation of the Canons are guidelines and represent the objectives toward which members of the engineering profession should strive. They are principles which an engineer can reference in specific situations. In addition, they provide interpretive guidance to the ASME Board on Professional Practice and Ethics on the Code of Ethics of Engineers.

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
  - a. Engineers shall recognize that the lives, safety, health and welfare of the general public are dependent upon engineering judgments, decisions and practices incorporated into structures, machines, products, processes and devices.
  - b. Engineers shall not approve or seal plans and/or specifications that are not of a design safe to the public health and welfare and in conformity with accepted engineering standards.
  - c. Whenever the Engineers' professional judgments are overruled under circumstances where the safety, health, and welfare of the public are endangered, the Engineers shall inform their clients and/or employers of the possible consequences.
    - (1) Engineers shall endeavor to provide data such as published standards, test codes, and quality control procedures that will enable the users to understand safe use during life expectancy associated with the designs, products, or systems for which they are responsible.
    - (2) Engineers shall conduct reviews of the safety and reliability of the designs, products, or systems for which they are responsible before giving their approval to the plans for the design.
    - (3) Whenever Engineers observe conditions, directly related to their employment, which they believe will endanger public safety or health, they shall inform the proper authority of the situation.
  - d. If engineers have knowledge of or reason to believe that another person or firm may be in violation of any of the provisions of these Canons, they shall present such information to the proper authority in writing and shall cooperate with the proper authority in furnishing such further information or assistance as may be required.
2. Engineers shall perform services only in areas of their competence.
  - a. Engineers shall undertake to perform engineering assignments only when qualified by education and/or experience in the specific technical field of engineering involved.
  - b. Engineers may accept an assignment requiring education and/or experience outside of their own fields of competence, but their services shall be restricted to other phases of the project in which they are qualified. All other phases of such project shall be performed by qualified associates, consultants, or employees.
3. Engineers shall continue their professional development throughout their careers, and should provide opportunities for the professional and ethical development of those engineers under their supervision.



4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest or the appearance of conflicts of interest.
- a. Engineers shall avoid all known conflicts of interest with their employers or clients and shall promptly inform their employers or clients of any business association, interests, or circumstances which could influence their judgment or the quality of their services.
  - b. Engineers shall not undertake any assignments which would knowingly create a potential conflict of interest between themselves and their clients or their employers.
  - c. Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed to, and agreed to, by all interested parties.
  - d. Engineers shall not solicit or accept financial or other valuable considerations, for specifying products or material or equipment suppliers, without disclosure to their clients or employers.
  - e. Engineers shall not solicit or accept gratuities, directly or indirectly, from contractors, their agents, or other parties dealing with their clients or employers in connection with work for which they are responsible. Where official public policy or employers' policies tolerate acceptance of modest gratuities or gifts, engineers shall avoid a conflict of interest by complying with appropriate policies and shall avoid the appearance of a conflict of interest.
  - f. When in public service as members, advisors, or employees of a governmental body or department, Engineers shall not participate in considerations or actions with respect to services provided by them or their organization(s) in private or product engineering practice.
  - g. Engineers shall not solicit an engineering contract from a governmental body or other entity on which a principal, officer, or employee of their organization serves as a member without disclosing their relationship and removing themselves from any activity of the body which concerns their organization.
  - h. Engineers working on codes, standards or governmental sanctioned rules and specifications shall exercise careful judgment in their determinations to ensure a balanced viewpoint, and avoid a conflict of interest.
  - i. When, as a result of their studies, Engineers believe a project(s) will not be successful, they shall so advise their employer or client.
  - j. Engineers shall treat information coming to them in the course of their assignments as confidential, and shall not use such information as a means of making personal profit if such action is adverse to the interests of their clients, their employers or the public.
    - (1) They will not disclose confidential information concerning the business affairs or technical processes of any present or former employer or client or bidder under evaluation, without his consent, unless required by law or court order.
    - (2) They shall not reveal confidential information or finding of any commission or board of which they are members unless required by law or court order
    - (3) Designs supplied to Engineers by clients shall not be duplicated by the Engineers for others without the express permission of the client(s).
  - k. Engineers shall act with fairness and justice to all parties when administering a construction (or other) contract.



- l. Before undertaking work for others in which Engineers may make improvements, plans, designs, inventions, or other records which may justify seeking copyrights, patents, or proprietary rights, Engineers shall enter into positive agreements regarding the rights of respective parties.
- m. Engineers shall admit their own errors when proven wrong and refrain from distorting or altering the facts to justify their mistakes or decisions.
- n. Engineers shall not accept professional employment or assignments outside of their regular work without the knowledge of their employers.
- o. Engineers shall not attempt to attract an employee from other employers or from the market place by false or misleading representations.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
- a. Engineers shall negotiate contracts for professional services on the basis of demonstrated competence and qualifications for the type of professional service required.
- b. Engineers shall not request, propose, or accept professional commissions on a contingent basis if, under the circumstances, their professional judgments may be compromised.
- c. Engineers shall not falsify or permit misrepresentation of their, or their associates, academic or professional qualification. They shall not misrepresent or exaggerate their degrees of responsibility in or for the subject matter of prior assignments. Brochures or other presentations used to solicit personal employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint venturers, or their accomplishments.
- d. Engineers shall prepare articles for the lay or technical press which are only factual. Technical Communications for publication (theses, articles, papers, reports, etc.) which are based on research involving more than one individual (including students and supervising faculty, industrial supervisor/researcher or other co-workers) must recognize all significant contributors. Plagiarism, the act of substantially using another's ideas or written materials without due credit, is unethical. (See Appendix.)
- e. Engineers shall not maliciously or falsely, directly or indirectly, injure the professional reputation, prospects, practice or employment of another engineer, nor shall they indiscriminately criticize another's work.
- f. Engineers shall not use equipment, supplies, laboratory or office facilities of their employers to carry on outside private practice without consent.
6. Engineers shall associate only with reputable persons or organizations.
- a. Engineers shall not knowingly associate with or permit the use of their names or firm names in business ventures by any person or firm which they know, or have reason to believe, are engaging in business or professional practices of a fraudulent or dishonest nature.
- b. Engineers shall not use association with non-engineers, corporations, or partnerships to disguise unethical acts.
7. Engineers shall issue public statements only in an objective and truthful manner.

- a. Engineers shall endeavor to extend public knowledge, and to prevent misunderstandings of the achievements of engineering.
- b. Engineers shall be completely objective and truthful in all professional reports, statements or testimony. They shall include all relevant and pertinent information in such reports, statements or testimony.
- c. Engineers, when serving as expert or technical witnesses before any court, commission, or other tribunal, shall express an engineering opinion only when it is founded on their adequate knowledge of the facts in issue, their background of technical competence in the subject matter, and their belief in the accuracy and propriety of their testimony.
- d. Engineers shall issue no statements, criticisms, or arguments on engineering matters which are inspired or paid for by an interested party, or parties, unless they preface their comments by identifying themselves, by disclosing the identities of the party or parties on whose behalf they are speaking, and by revealing the existence of any financial interest they may have in matters under discussion.
- e. Engineers shall be truthful in explaining their work and merit, and shall avoid any act tending to promote their own interest at the expense of the integrity and honor of the profession or another individual.
8. Engineers shall consider environmental impact in the performance of their professional duties.
- a. Engineers shall concern themselves with the impact of their plans and designs on the environment. When the impact is a clear threat to health or safety of the public, then the guidelines for this Canon revert to those of Canon 1.
9. Engineers accepting membership in The American Society of Mechanical Engineers by this action agree to abide by this Society Policy on Ethics and procedures for its implementation.

Responsibility: Council on Member Affairs/Board on Professional Practice and Ethics

Adopted: March 7, 1976

Revised:

December 9, 1976

December 7, 1979

November 19, 1982

June 15, 1984

(editorial changes 7/84)

June 16, 1988

September 12, 1991

September 11, 1994

June 10, 1998

---

## APPENDIX TO SOCIETY POLICY P-15.7 ETHICS

### PUBLICATION OF PROFESSIONAL/TECHNICAL ARTICLES, PAPERS AND REPORTS

A statement of the

Board on Professional Practice and Ethics

Of

The American Society of Mechanical Engineers

May 24, 1991

POLICY STATEMENT ON PUBLICATION OF  
PROFESSIONAL/TECHNICAL ARTICLES, PAPERS AND REPORTS

**Background**

ASME's Board on Professional Practice and Ethics (BPPE) and other professional engineering bodies have considered cases involving ethics violations of publication rights and authorship of papers. These and similar ethics cases are of serious concern to BPPE because strict adherence to soundly-based ethical standards is essential to the engineering profession if it is to attain professional status in our society and publicly.

Not all universities and industrial research facilities have definitive and clearly written procedures covering the subject of publication rights and authorship. This lack of clear direction has led to misunderstandings and confusion among students performing research and supervising faculty, as well as supervisors and researchers in industry.

In one ASME ethics case, a professor wrote a technical paper based on the thesis work of his graduate student and listed the former student as a junior co-author without the consent, or prior knowledge, of the student. The former student assumed that the professor had used the student's thesis work as his own and, consequently, lodged an ethics complaint against the professor.

The BPPE supports the recognition of joint contributors to professional/technical publications. Persons making substantial or key contributions to a project or work on which such publications are based should receive credit commensurate and appropriate to their contributions. This credit may include co-authorship or acknowledgment. Co-authors listed on proposed and accepted publications should have entered the joint authorship arrangement by mutual consent prior to submittal of the document for publication and should have received written permission to use any unpublished work of others which serves as the major basis or key component of the publication.

**Policy Statement**

To avoid situations tending to suggest an ethics violation, technical communications for publication (articles, papers, reports, or the like) which are based on research involving more than one individual (including students and supervising faculty, industrial supervisor/researcher, or other co-workers) should adhere to clearly defined and appropriately disseminated guidelines on authorship. These guidelines should be publicized in corporate, university or other employer policies and should take cognizance of professional/technical society recommendations.



## **Attachment 8.**

## Patents Cited Relating to Inadvertent Unlatch

(9/23/2002)

Patent No.	Date	Assignee	Quote
2,622,293	12/23/52	Air Assoc.	"....the invention has particular reference to a safety belt buckle which is secure against accidental or unintentional uncoupling thereof and which is adapted for quick release."
2,902,737	9/8/59	Switlik	"Thus, some connectors are so heavy and cumbersome as to unduly and unnecessarily burden the wearer. Some types also have the disadvantage that they are too easily released or opened by accidental means."
2,904,866	9/22/59	Carter Eng.	"The possibility of accidental release of the buckle must be at an absolute minimum..."
3,118,208	1/21/64	C & W Mfg.	"A principal object of the present invention is to provide a buckle construction that is relatively free from the possibility of accidental or inertia-operated unlocking."
3,131,451	5/5/64	Hamill	"Such an action also increases the amount of movement necessary to effect unlatching, thereby minimizing the possibility of accidental unlatching and permits the use of a short, relatively light release handle, minimizing the chance of accidental unlatching by a coat sleeve, etc."
3,256,576	6/21/66	GM	"In addition some of the buckles are likely to open upon the application of a force at the rear of the pivot of the latch releasing member causing inadvertent releasing of the buckle."
3,349,445	10/31/67	Irving	"A further object of this invention is the provision of an improved push button type of buckle for safety seat belts in which the cover is provided with a recessed area for access to a push button actuating means, thus minimizing the possibility of accidental release arising from the buckle being brought into contact with other parts of the vehicle or other objects."
3,355,781	12/5/67	Borg-Warner	"It is also desirable to provide means for unlatching the buckle which is readily accessible to the user and easy to operate, but is not likely to be unintentionally disengaged as a result of deceleration forces acting on the mechanism."

**Inadvertent, Page 2.**

3,370,329	2/27/68	Takada	"However, none of these prior-art devices are altogether satisfactory as they are structurally frail, sluggish in handling, too easy to unlock and susceptible to wear when subjected to frequent engaging and disengaging operations of the buckle locking elements. Moreover, the safety buckles of the known type are disadvantageously complicated and hence costly."
Re. 26,754	1/6/70	Hamill	See: 3,131,451, supra.
3,523,341	8/11/70	Spires	"In addition, conventional seat belt buckles are usually opened or released by means of pressing a button or lifting a cover plate, each of which mechanism is relatively easy to inadvertently release"
3,605,210	9/20/71	Jim Robbins	"In order to satisfy certain safety criteria, the release member must be in a protected position so that it cannot be easily accidentally actuated and this is usually connected to the locking member and is movable to release the locking member. The housing must not only accommodate this movement but for safety reasons, to reduce the possibility of the release member being accidentally actuated, it must be in a protected or recessed position adding to the required thickness of the housing."
3,812,556	5/28/74	Sitam	"Such safety belts show many drawbacks, mainly due to their rather limited fastening action, to being susceptible to damage, and to possible unintentional opening of the buckle." "Such projecting components may cause substantial ill-effects, as e.g. unintentional openings, damages to clothing and injury to the user, in particular under emergency conditions."
3,986,234	10/19/76	Frost Eng'r	"A latch is pivotally mounted on the buckle body for rotating movement in response to a force thereon acting in a direction opposite to the force required to move the slide to the strike unlocking position. Until the latch is thus rotated, interfering surfaces on the slide and latch prevent inadvertent movement of the slide." "More specifically, it is an object of the present invention to provide a releasable fastener which cannot be accidentally actuated and yet which can be readily intentionally operated even under highly adverse circumstances."
4,068,354	1/17/78	Allied	References patent no. 3,605,210
4,069,557	1/24/78	Allied	References patent no. 3,605,210

**Inadvertent, Page 3.**

4,150,843	4/24/79	GM	"The present invention assures against inadvertent belt release by providing a manually operable latch which must be released in order to effect rearward pivoting movement of the hook member to release the belt."
4,200,311	4/29/80	GM	"One feature, object and advantage of the invention resides in the provision of a seat belt securing hook having a push button releasable latch which insures against inadvertent rearward pivoting movement of the hook member to the belt releasing position prior to occupant depression of the push button."
4,358,877	11/16/82	Kangol	"The inclination of the front wall of the release button minimizes the risk of inadvertent actuation of the button to cause the tongue to be released from the socket."
GB2104141A	3/2/83	Tokai Rika	"The conventional buckle has at least one drawback, however. For instance, a force may be applied to the manually operable member portion of the buckle body by an object in the interior of an automobile....Therefore, the seat belt would become unfastened."
4,400,857	8/30/83	NSK-Warner	<p>"The specification describes a push-button type seat belt buckle whose tongue releasing push-button, when mounted on a vehicle, faces toward the passenger and is located in a somewhat sunken position, thereby to facilitate the release of the tongue while avoiding accidental release thereof due to unintentional contact of the passenger to the push-button."</p> <p>"In this state, as will be apparent from FIG. 1, the push-button 6 is urged by virtue of the biasing force of the spring 39 to a position where the stopper portions 35 and 36 are in abutment with corresponding inner surfaces of the covers 7 and 8, but since the operating surface 34 is somewhat sunken in the openings 41 and 42, the push-button 6 is not likely to be depressed even when an elbow or other part of the passenger happened to contact it."</p>
4,407,538	10/4/83	Bauer	"Moreover, it should be noted that there is no exposed push button, flap or other conventional seat belt actuator which could be inadvertently actuated by the wearer's hand or an object on the wearer's lap. That is, some positive inward force (upward in FIG. 6) must be exerted on disc 22 and it is highly unlikely that such force could be applied inadvertently."

**Inadvertent, Page 4.**

4,566,161	1/28/86	ASE (UK)	"The inclination of the front wall 32 of the release button minimizes the risk of inadvertent actuation of the button to cause the tongue to be released from the socket."
4,675,956	6/30/87	Cohen	"It will be evident from the above description that the safety seat belt buckle device will prevent the accidental or deliberate release of the safety seat belt buckle by children who will not be able to depress both of the actuation levers simultaneously with the required force as determined by the springs 25A and 25."
EP0252488A1	1/13/88	NSK-Warner	"Since the upper cover 12 is extends fully in the frontward direction to a position substantially equal to the upper edge of the operated surface 8a of the release button 8, the release button 8 is not brought to the operated position thereof unless it is intentionally pushed in, namely, rearwardly to the operated position by a finger or the like. More specifically, the upper cover 12 is shaped and dimensioned, for example, in such a manner that the tongue 14 is not unlatched from the latch piece 6 even when a ball having a diameter of 28 mm is pressed against the operated surface 8a of the release button 8 while maintaining the ball in contact with the upper surface of the tongue 14. The latching of the tongue 14 is hence not released unintentionally even if the operated surface 8a is pressed accidentally by an elbow or the like."
4,797,984	1/17/89	NSK	"More specifically, the upper cover 12 is shaped and dimensioned, for example, in such a manner that the tongue 14 is not unlatched from the latch piece 6 even when a ball having a diameter of 28 mm is pressed against the operated surface 8a of the release button 8 while maintaining the ball in contact with the upper surface of the tongue 14. The latching of the tongue 14 is hence not released unintentionally even if the operated surface 8a is pressed accidentally by an elbow or the like."

**Inadvertent, Page 5.**

4,876,772	10/31/89	Indiana Mills	"Some of the problems associated with safety belt buckles include user difficulty installing the belt tongue in the buckle, inadvertent release by the user bumping the release button, premature release due to inertial effects or deformation during a collision, and crushing damage to a buckle which has fallen into a position where it is exposed to damage by closing a vehicle door on the buckle or forcing a foldable seat onto it."
4,920,620	5/1/90	NSK	In this tongue-locked state, the upper cover 12 is extended well in the forward direction as shown in FIG. 3, and its leading end comes to substantially the same position as that of the push button 9, so that even if, for example, a bulb of 23 mm diameter or greater contacts the push button 9, the lock is not released. Specifically, if an elbow, for example, contacts the operating surface 9a, inadvertent release of the lock cannot take place."
4,942,649	7/24/90	Indiana Mills	"Some of the problems associated with safety belt buckles include user difficulty installing the belt tongue in the buckle, inadvertent release by the user bumping the release button, premature release due to inertial effects or deformation during a collision, and crushing damage to a buckle which has fallen into a position where it is exposed to damage by closing a vehicle door on the buckle or forcing a foldable seat onto it."
4,955,115	9/11/90	Tokai-Rika	"In buckle devices of this type, a portion of the release button is exposed outside the buckle cover for enabling the operation. There is therefore a risk of a portion of the body of the occupant or a certain object striking against the release button and accidentally moving the same and, hence, a risk of the lock plate .....this movement resulting in disengagement from the tongue plate."
5,075,937	12/31/91	BSRD	References patent no. 4,358,877
5,280,669	1/25/94	Takata	"The marginal portions of the pressing surface 7a of the operating member 7 are surrounded by the cover member 10 in almost the same plane, and this prevents unexpected release of the buckle engagement when elbow of the passenger touches the operating member 7."